DOCUMENT RESUME

ED 121 935 CE 006 172

AUTHOR Stucky, Franklin; And Others
TITLE Mini-Pak Fencing.
PUB DATE 73
NOTE 35p.; Some pages will not reproduce well in microfiche; Best copy available

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage
DESCRIPTORS *Agricultural Education; Educational Objectives; Illustrations; Performance Based Education; Skill Development; *Teaching Guides; Vocational Agriculture
IDENTIFIERS *Fences

ABSTRACT

The document presents unit plans which offer lists of experiences and competencies to be learned in the construction, planning, and building of fences. The lessons are comprised of seven areas: (1) planning the location and arrangement of fences, (2) fencing and fence building equipment, (3) types of fences, (4) constructing fences, (5) end and corner construction and bracing, (6) fences for special passageways, and (7) the mathematics of fencing. Each lesson plan presents information related to its: (1) objectives, (2) introduction, (3) subject matter presentation (questions and points to stress), (4) student assignment, and (5) references. A series of 16 illustrations presents different types of materials and tools used for fencing. (EC)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED121935

APR 30 1974

MINI-PAK

FENCING

BEST COPY AVAILABLE

by

MVAIA District 12 High School South Committee

1973

Franklin Stucky - New Ulm
David Hanson - Jackson
Rodney Larson, Springfield
Larry Baumgardt - Sleepy Eye
Ronald Lindeman - Sleepy Eye
David Hillier - St. James

EC 006 172

Reviewed by

Bernard Uran - Northome, Minnesota
Professor Forrest Bear, Ag. Engr. Dept.
University of Minnesota
St. Paul, Minnesota

Price $1.00

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

TABLE OF CONTENTS

TITLE	PAGE
Planning the Location and Arrangements of Fences	1
Fencing and Fence Building Equipment	2
Types of Fences	4
Constructing Fences	7
End and Corner Construction and Bracing	12
Fences for Special Passageways	14
The Mathematics of Fencing	16

I. UNIT: Fencing

II. LESSON TITLE: Planning the Location and Arrangements of Fences

III. OBJECTIVES: The ability to . . .

A. Recognize and justify the use of permanent fences and movable fences.
B. Fit fences into your conservation and farming program.
C. Recognize when fences should be moved or removed.
D. Arrange fences and passageways for convenience and labor saving.
E. Calculate the economics of fencing.

IV. INTRODUCTION: Few people have ever taken enough time to plan in advance the proper arrangement of fences and the proper type of fence to use. The purpose of this unit is to acquaint the student with these procedures.

V. SUBJECT MATTER PRESENTATION:

Questions	Points to Stress
A. What are the major steps in planning and arrangement of fences. (pp 1-6)	1. Obtain a sketch of your farm. If not available, sketch your farm to scale. 2. Plot the farm land into areas best suited to: a. Permanent pasture or hay b. Row crop c. Grain crops 3. Divide areas into fields to fit the crop rotation. 4. Sketch in lanes from farmstead to fields. 5. Indicate gates, fences and other passageways.
B. What are the steps in planning permanent fences. (Fences designed to last many years) (pp 7-9)	1. Lay out imaginary fences around farm boundaries. 2. Indicate fences around permanent fields such as pastures, ponds, or woodland. 3. Indicate permanent lanes. 4. Indicate permanent fences around cultivated areas. 5. Indicate fences around special areas.
C. Planning movable or temporary fences. (Fences used only a few days or months) (pp 9-10)	1. Calculate the cost in comparison to permanent fences. 2. Can they be relocated in another place from year to year? 3. Can they help adjust the size of other land parcels? 4. Can they be used in place of permanent fences? 5. Can they fit the conservation program of the farm?

VI. STUDENT ASSIGNMENT:

A. Layout imaginary fence lines on the sketch of the farm.

VII. REFERENCE:

Planning Farm Fences. AAVIM, Ahtens, Georgia, c1966. p. 3-10

I. UNIT: Fencing

II. LESSON TITLE: Fencing and Fence Building Equipment

III. OBJECTIVES: The ability to . . .

A. List the proper use for the common tools and equipment.
B. Select the proper tools and equipment for a particular fencing job.

IV. INTRODUCTION: Fencing equipment may be purchased in various types and sizes for the home and farm. Elaborate equipment is not necessary for many installation and maintenance jobs.

V. SUBJECT MATTER PRESENTATION:

Questions	Points of Stress
A. What equipment is most commonly used in fencing?	1. Fence posts: Posts come in various sizes and forms of wood & steel. Wood posts are mostly treated pine or cedar, varying in length from 5 1/2 ' to 8' long, & 2 1/2" and larger in diameters. Metal posts are made up of rail, billet, & alloy steal. Some common steel posts are "U" Bar, studded "L", & studded "T" and punched channel. There are also various types of concrete, pipes & rods used. The steel and concrete posts should last 20-30 years. 2. Wire: There are 3 types of wire: woven, barbed, & smooth. When buying wire, it is important to check the tag. Factors to be considered are wire size, style, type of protective coating, thickness of coating, & wire strength. a. Woven wire fencing for general farm use comes in 20 rod rolls. Woven wire varies in size from 9 gauge to 14 1/2 gauge. It has tension strength (curved) acting as a spring. Life expectancy is 20-50 years. It has 2 types of joints: hinge & stiff stay joints. b. Barb wire: has either 2 or 4 points per barb & are spaced 4-5" apart. Most barb wire is 12 1/2 gauge or 14 gauged. There is no tension curve in barb wire. Barb wire of all sizes comes in 80 rod rolls. c. Smooth wire: smooth wire has been widely used as brace wire for anchor & brace assembles. Many farmers regard the smaller sizes as very satisfactory for electric fencing. It's main advantage is in ease of handling when erecting or removing a fence. 3. Lumber: Lumber used for fences and gates are of No. 1 or No. 2 softwood and No. 2 common hardwood grades are used in better fences. In lighter fences & gates No. 2 & 3 common hardwood are used. All wood should have been treated with preservative. Board sizes are usually a 1 x 6 that is 8 ft. long. Corrals are usually 2" thick. Common preservatives are: creosote, pentachlorophenol, zinc chloride, copper sulfate and sodium floride. 4. Fasteners for Fences: Fasteners to wood posts may consist of (a) standard U-shaped staples or (b) L-shaped staples. Steel post fastener will be some type of wire clip. If using a wood fence you will be using some type of nails plain shank, fluted, helically threaded or annularly threaded.

Questions	Points to Stress
B. What are the tools most commonly used in fencing?	1. Tools for clearing fence line: land clearing tools are used and include leather gloves, ax, swing blade, mattock, shovel, and brush axe. 2. Laying out fence line, post alignment and placement, tools required: wire splicer, spade, 16' gauge pole, 5' stakes, wire cutting pliers, 6' rule and steel tape. 3. Tools & materials for steel posts: steel post driver, adjustable end wrench, gauge stick, sand, crushed stone, & cement. If you are building an anchor & brace assembly of steel, figure 3 1/2 cubic ft. of concrete for an end & 4 1/2 cubic ft. for a corner. A gauge stick should be marked as to location of wire on a fence. 4. Additional tools & materials for wood or concrete posts: post hole digger, post auger, tamping bar, spud, axe, spade, hand saw, brace & bit, & steel dowels. Steel dowels should be approximately 1/4" or 3/8" x 4'. Use two dowels for each horizontal brace. Wood boring bit should be same size as dowels. 5. For stretching and attaching fences: double jack stretcher, wire clamp, U-stable, L-stable, block & tackle with secure clamp & 18"-24" rod (for tightening brace wire). Block & tackle is used mostly for stretching wire.
C. What ways are there to preserve fencing materials?	<u>Steel Wire</u> 1. Steel wire has normally been protected by zinc galvanization but can also be aluminum coated or copper coated. 2. The amount of zinc on fencing materials is measured in ounces per square foot of wire surface. 3. Class 1 is the lightest coating of zinc & class 3 the heaviest. 4. The life of the zinc coating depends upon the climatic conditions and re size. 5. Aluminum coating on steel wire has a corrosion resistance 3-5 times greater than zinc galvanization. 6. Aluminum coatings are more resistant to heat than zinc coatings. 7. Galvanized barbed wire points become dull faster than does aluminum coated barbed wire. 8. Copper coating is used with the smooth wire. <u>Wood</u> 1. Preservatives for fences and gates should be point, creosote, (penta) pentachlorophenal, or copper nathenate in heavy fuel oil or a combination of these. 2. Wood can be either pressure treated or soaked. If soaked the method used can be cold or hot followed by cold.

VI. STUDENT ASSIGNMENT:

A. Have the students learn to use and identify fencing tools.
B. Have the students learn proper maintenance and care of the tools.
C. Prepare a display of wire gages with smooth wire.
D. Prepare a display of barbed wire.
E. Prepare a display of hinge joints and stiff stay joints used to fasten stay and line wires together.
F. Prepare a display of fencing staples and nails.

VII. REFERENCES:

A. Planning Farm Fences, AAVIM, Athens, Georgia, 1966
B. Building Farm Fences, AAVIM, Athens, Georgia, 1969, pages 15-24, 43, 1-2, 23-33

VIII. MATERIALS AND EQUIPMENT NEEDED:

A. Samples of smooth, barb, and woven wire
B. Tools for fitting fence
C. Fence posts and fasteners

I. UNIT: Fencing

II. LESSON TITLE: Types of Fences

III. OBJECTIVES: The ability to . . .

A. Recognize the common types of farm fences
B. Read and use design numbers in selection of woven wire fences
C. Determine which types of fences best meet the needs of different situations.

IV. INTRODUCTION: For the next step you must decide which type of fence best fits your needs. There are several different types to select from. The types discussed in this unit are: woven wire, barbed wire, board, electric, cable, panel, or a combination of these.

Your decision on which of these types to use will be influenced by: (a) the kind of livestock you are fencing, (b) whether you will keep different kinds of livestock in the same same field, (c) how often you inspect your animals, (d) whether you need to fence out dogs or wolves, (e) how closely the animals will be confined, (f) how much money you have available for fencing, and (g) how long you expect your fence to last.

V. SUBJECT MATTER PRESENTATION:

Questions		Points to Stress				
		Cattle	Hogs	Sheep	Horses	Comb.
A. Which types of fence is best for which types of livestock?	1. Barbed wire	good	poor	fair	fair	poor
	2. Woven wire	good	good	Excell.	fair	fair
	3. Board	excellent- - - -

Questions	Points to Stress
B. What grades of fence materials are under each type? (Table 1.)	1. Barbed wire: 2 point, 4-inch spacing 3 strands 12 1/2 gage 4 " " " 5 " " " 3 strands 14 gage Barbed wire: 4 point, 5-inch spacing 3 strands 12 1/2 gage 4 " " " 5 " " " 2. Woven wire: light wt. top & bottom Wires 11 gage, Filler wire 14 1/2 gage Height 26-32" Med. wt. top & bottom wires 10 gage, Filler wire 12 1/2 gage, Height 26-47" Heavy wt., top & bottom 9 gage, Filler wire 11 gage (height 26-47") X-Heavy top & bottom & Filler wire 9 gage, Height 39-47" 3. Boards: treated and untreated 4. Electric: Barbed wire 12 1/2 gage Steel wire 12 gage and 17 gage Copper covered steel wire, 18 gage Aluminum wire 9-13 gage 5. Panel:: Galvanized (Extra Heavy)
C. What are the comparative costs?	1. Barbed wire----------Medium Woven wire----------Medium Board----------High Electric----------Very low Panel----------High Cable----------Low
D. What upkeep ratings are projected for fencies? (Table 1.)	1. Barbed wire----------High Woven wire----------Medium Board treated----------Low Untreated----------High Electric----------Medium Panel (woven wire)----------Very low Cable----------Very low
E. What is a design no. in woven wire fencies?	Example 1. Design No. "1047-12-11" 2. 10 is for ten line wires 3. 47 is 47 inches high 4. 12 is the inches of space between the stay wires 5. 11 is the size of filler wires used in the fences.
F. What are stay wires?	1. The vertical wires that tie the line wires together are called stay wires.
G. What are filler wires?	1. The wires between the top & bottom line wires are filler wires.

Questions	Points to Stress
H. What are the advantages of electric fences?	1. Low cost 2. Cheap to operate 3. Easy to construct and remove 4. Helps older permanent fences 5. Easier to keep fence row clean
I. What are the disadvantages of electric fences?	1. Livestock needs training 2. Might be shorted out with weeds or brush 3. Must be kept in operation full time 4. Must be grounded good 5. Potential hazard

VI. STUDENT ASSIGNMENT:

A. Draw your farmstead fenceline pattern and determine which fence type will be best in each situation considering cost, strength, and life of the fence.
B. Check sources locally for fencing materials and prices to use in completing this project.
C. Prepare a display explaining the design numbers for woven wire.
D. Prepare a display of tags taken from rolls of woven wire.

VII. REFERENCES:

A. Planning Farm Fence, AAVIM, June 1966, pages 15-20

I. UNIT: Fencing

II. LESSON TITLE: Constructing Fences

III. OBJECTIVES: The ability to . . .

A. Construct a quality fence that will give long and maintenance free service.
B. Layout fencing materials, stretch and attach to different kinds of posts.
C. Correctly determine spacing for line of barbed wire fences of different heights and different number of lines.
D. Explain why ground rods are important.
E. Construct sturdy anchor and brace assemblies.
F. Correctly ground a fence.
G. Outline the differences in constructing a temporary fence vs. a permanent fence.

IV. INTRODUCTION: Many fences have been built that last 20 years and longer. Other fences have been built that fail or need major repair within a few years after construction. High quality materials can be used to construct fences, but if materials are not put together correctly, fences will be of poor quality and require frequent maintenance.

V. SUBJECT MATTER PRESENTATION:

Questions	Points to Stress
A. How should anchor and brace assemblies be set?	1. Steel anchor and brace assemblies. (pp 6-8) a. Dig post hole for anchor post 12 inches in diameter & 3 ft. 6 in. deep. This depth will be below the frost line in most areas. b. Attach brace to anchor post. c. Set anchor post in hole from step 1 and dig hole for brace where it contacts the ground. d. Mix & place stiff concrete mix around anchor post. Plumb post, tamp concrete & slope concrete away from post for drainage. e. Place and tamp concrete for brace pier. NOTE: Concrete should be cured 1 week before fence is attached. 2. Wood anchor and brace assemblies. (pp 8-10) a. Dig hole 12 in. in diameter & 3 ft. 6 in. for anchor post. b. Place post in hole, replace small amounts of soil and tamp thoroughly while post is plumb. Select brace & layout position from anchor post to brace post, dig hole for brace post and place but do not tamp. c. If wood brace is selected use dowel in brace & posts. (Holes for dowels should be 6 to 12" from top of anchor & brace assembly & 2 to 3" deep.) If pipe or angle iron brace is used, notch anchor & brace posts about 1/2 - 3/4" deep. d. Position brace horizontal to ground, secure brace, replace soil around brace post and tamp.

Questions	Points to Stress
A. continued	3. Installing brace wire (pp 10-11) a. Drive staple about 1/2 its length into brace post 4" from top opposite the side of the brace. In similar manner, drive another on the anchor post about 4" from ground level on side opposite brace. b. Unroll sufficient wire for 2 complete loops around the anchor and brace posts. c. Thread wire through staples to make 2 loops around posts. Remove rough slack & make a good splice. d. Use a good strong stick, rod, or pipe 18 to 24" long to twist brace wire tight. Leave member used for twisting in place.
B. What is the best method for setting line policy?	1. Wood or Concrete Posts (pp 11-12) a. Stretch cord, rope or barbed wire between the 2 anchor posts assemblies. (Some farmers like to use barbed wire between the woven wire and the ground. If you plan to do this it will save time to use barbed wire for the guide line). This will be the guide to set line posts by. b. Along this guide line measures line post spacings with gage pole. Recommended post spacings: woven wire fence, 15-16 ft. barbed wire fence, 12-14 ft. board fence, 5-8 ft. c. Mark ground line on post or digging tool. A ground line will be used continuously to maintain a uniform post and fence height. The ground line distance is the distance from the ground to the top of the post. (Usually fence height plus 3-4 inches.) d. Fasten wire to posts with fencing clamps.
C. What variations will have to be made over wet areas, gullies, or streams?)pp 13)	1. If water flow is restricted to a narrow path (less than 16 ft. wide) setting 2 line posts - one on each side of the depression should solve the problem. 2. If the fence crosses a wet area of considerable distance it would be best to use a weighted post arrangement. See diagram on page 13. 3. Do not try to set posts in a gully or stream. If gully or stream is less than 16 ft. wide set line posts on each side & continue the fence across it. 4. If the gully or stream is greater than 16 ft. wide, anchor-and-brace assemblies should be used on each side & stretch fence as separate units.
D. What is the most practical way for placing fence? (p 14)	1. Determine how to unroll woven wire a. Close mesh near post b. Wire on inside of posts 2. Start 3 ft. ahead of anchor post, unroll wire for 1 or 2 line post spacing.

(continued)

Questions	Points to Stress
D. cont.	3. Remove one stay wire by sliding off end of line wires. 4. Stand fence against anchor post & adjust to desired height, staple fence in position, extend each line, wire around post and wrap to itself.
E. How should the fence be stretched? (pp 15-16)	1. Tractor stretching is dangerous a. If fence breaks, recoil from tight wire may be sufficient to throw chain and clamp bar against tractor and operator. b. National Safety Council suggests using block and tackle or similar device for stretching fences. c. Woven wire is ruined by stretching with a tractor. 2. Safe Proceudre a. Erect dummy post for attaching stretcher. b. Stand fence against line posts. c. Attach chains or hooks of stretcher to dummy post. d. Attach clamp bar to fence at a position about opposite anchor post. e. Attach ratchets or block and tackle to clamp bar. f. Tighten fence slowly while watching so that no part of the wire gets caught along line posts. Slow tightening will allow tension to be evenly distributed along entire length of fence. g. Continue tightening until tension curves in woven wire are about 1/3 removed.
F. What supplies will be needed to attach fences to wood posts? To steel Posts?	1. Attaching at second anchor post)p. 18) a. Staple each line wire to anchor post. b. Remove sufficient stay wires for a distance sufficient to extend line wires around anchor post and wrap back on itself. c. Cut middle line wire extend around post, wrap back on itself. d. Do the same with every other wire working toward top & bottom. Leave top wire until last. 2. Attaching fence to line posts (pp. 18-19) a. Attach top wire first. 1) Wood posts - set staple cross-wise of grain to prevent splitting. Wire should be held closely, not snugly or tightly. 2) Steel posts - use steel post clamps. b. Attach bottom wire next while hold down with foot. c. Fasten every other line wire on remainder of post. If spacing of line wires on bottom of fence is quite close fasten every third wire until spacing between line wires is approximately 6 inches. d. Attach fence to remaining posts in same manner.
G. How should barbed wire be used with woven wire?	1. Unrolling and stretching barbed wire. (pp. 19-22) a. Mark position on anchor post where barbed wire will be attached when using barbed wire above woven wire, first strand should be within 2" of top line wire so livestock cannot get their head between woven wire and barbed wire. b. When attaching barbed wire to gate post or anchor posts where there will be a passage, always remove barbs to prevent injury to livestock.

Questions	Points to Stress
G. continued	1. continued c. Staple wires in position on wood posts. d. Cut one of the 2 strands where barbs have been removed & untwist. Uncut wire will hold tension on the line. e. Wrap cut wire around on itself. Then cut second wire & wrap it in same manner. Always wrap wire back on itself, do not depend only on staples. f. Attach remaining wires in same manner.
H. What is different about building a fence completely of barbed wire? (pp. 23)	1. Procedure is very similar to that described for woven wire. 2. Use recommended anchor-brace assemblies as previously described. 3. There are 3 additional points to consider: a. Spacing between lines of barbed wire can be determined by taking desired height & divide by desired n number of lines. Usually 48 to 52" high is satisfactory. b. Beginning to stretch and attach wire with the top of bottom line is determined by the condition of the anchor & brace assembly. If the anchor & brace assemblies are well built, it makes no difference. If anchor & brace assemblies are questionable, start with top wire because this will take the slack out of your anchor and brace assemblies. c. Twisted wire stays should be installed every 16 1/2 ft. on suspension type barbed wire fences.
I. Why and how should fences be grounded? (p. 24)	1. Livestock that are near fences which receive a lightning charge are usually killed instantly. An ungrounded fence can carry an electric charge up to two miles. Any ungrounded fence with wood posts or steel posts set in concrete are a hazard to livestock. 2. Ground rod installation: a. Pound end of pipe to wedge shape. Length should be 5 1/2 ft. plus fence height. b. Select location for driving ground rod. If there is a low area along the fence, it will probably be the best location. The ground rod is more likely to be in moist soil all of the time. c. Drive ground rod into soil near wood post 5 ft. & allow 4 to 6" of rod to extend over the fence. d. Connect ground rod to post with 3 or 4 pipe clamps. Ground rod should be in contact with all line wires of the fence.
J. How can a temporary fence be built? (pp. 25-29)	1. Anchor and brace assemblies are constructed by driving pointed wood posts into the ground. Toe nail (wood braces) or wire top of brace into position. 2. Line posts can be spaced 15 to 25 ft. driven & insulators attached for electric fences. Procedures for placing & attaching woven wire & barbed wire were covered previously.

Questions	Points to Stress
J. continued	3. Temporary gates (pp. 28-29) a. Cut pole or stake about 12" longer than fence height. b. Attach barbed or woven wire to pole so the pole will be 6 to 8" from the post to which it attaches when wires are fairly loose. c. Make upper and lower wire loop on attachment post. d. Test assembly to see if pole can be fitted into loops without difficulty. 4. Electric fence gates (pp. 29) a. Attach spacer insulator to end post. b. Splice wire to line wire. c. Form a 6-inch loop & attach an insulated screen door spring or a purchased gate handle. d. Repeat steps (a) & (b) at the opposite post. e. Attach the wire to gate hook.
K. What are the procedures for constructing cable fences?	1. Construct anchor and brace assemblies. 2. Wood posts or 4" steel pipe can be used as line posts & must be set very well. Setting in concrete is advisable. 3. Bore holes through line posts. This step may be easier before posts are set but holes must be properly aligned during setting. 4. Thread cables through line posts, secure at anchor end by wrapping around post and attaching cable clamps. 5. Use spring device at opposite end to maintain correct tension on cables. Coil springs from old cars can be used quite well for this.

VI. STUDENT ASSIGNMENT:

A. Lay out the line and set posts for a 5 rod section of fence.
B. Determine the proper wire spacing for a four-strand barb wire fence and
C. mark the posts.
C. Prepare a display showing a properly grounded fence.
D. Prepare a classroom model of a cable fence corral. Picture wire, dowels & ball point pen springs can be used for materials.

VII. REFERENCE: Building Farm Fences, AAVIM, Athens, Georgia, 1969.

I. UNIT: Fencing

II. LESSON TITLE: End and Corner Construction and Bracing

III. OBJECTIVES: The ability to . . .

A. Recognize the importance of proper bracing.
B. Determine if a bracing system has been properly constructed.
C. Recognize the various types of bracing.
D. Select adequate materials for ends and corner of fences.

IV. INTRODUCTION: It is clearly seen as one drives through rural areas, that many farm fences either are failing; have failed; because of bracing problems. Many farmers do not know how to build an adequate anchor and brace assembly that will last. Others don't think anchor and bracing an important topic. The goal of this unit is to help you understand the problem and to suggest possible solutions.

V SUBJECT MATTER PRESENTATION:

Questions	Points to Stress
A. Why are anchor and brace assemblies important? (pp. 29-30)	1. They are located at either the ends or turning points of a fence, and are responsible for maintaining fence wire tension. 2. The tension on an end post may range as high as 4500 lbs. Such a post needs assistance in retaining its original position.
B. What are some reasons why an anchor-and-brace assembly might fail? (pp. 30)	1. Improper design; will not stand fence pull. 2. Brace span too short. 3. Brace member too light; buckles under pressure. 4. Toe nailing on brace gives way. 5. Brace set too low in end and brace posts. 6. Posts set too shallow. 7. Poor quality post and material.
C. What are some recommended types of corner bracing?	1. Wood or steel horizontal brace design. It is strong, relatively inexpensive, and requires only a moderate amount of labor to construct. 2. Rosemount design. Used on ends or corners where extra strength is required. 3. Cross-brace double span. This is another heavy duty design. But to get the extra strength, the fence is attached to the center post. 4. Steel diagonal brace. A very effective style when the posts are set in concrete.
D. What recommendations can we make for usage of proper methods and materials? (pp. 33-35)	1. With wood anchor & brace assemblies, small posts can be used, but they will not last as long as larger ones unless they are of a durable hardwood variety or treated with a good preservative. 2. Wood or steel posts for either an end or corner assembly should be set 3 1/2 ft. deep. A corner post set at 2 1/2 ft. deep is only about half as strong as for the 3 1/2 foot setting.

Questions	Points to Stress
D. Continued	3. Size and type of compression brace. For wood construction, the compression brace is usually a standard post which is; a. Treated with wood preservative or is of durable wood. b. Straight or almost so. c. Free of splits or imperfections. 4. Steel bracing. For steel construction, the tube or pipe should be at least 2 inches in diameter. 5. Size of brace wire. Two kinds of wire are commonly used for brace wire: a. 9-gage, smooth, galvanized brace wire. b. 12 1/2 gage, barbed wire. 6. Type of brace wire. Barb wire has three disadvantages: a. It is more difficult to work than smooth wire. b. It lasts only about half as long when exposed to weather. c. Unless the wires are evenly loaded, barbed wire will break much quicker than regular brace wire.

VI. STUDENT ASSIGNMENT:

A. Using a pan filled with sand, construct models of the various types of anchor and brace assemblies. Test them by using a dairy scale for exerting tension.
B. Prepare a photo display of improper and proper anchor & brace assemblies. If possible, record also, the length of time the assembly has been in use.
C. On a field trip, record reasons why anchor-and-brace assemblies failed.
D. Construct the 4 types of anchor and brace assemblies, splitting the class into work teams.

VII. REFERENCE: Planning Farm Fences, AAVIM, Athens, Georgia, c1966. pp. 29-35.

I. UNIT: Fencing

II. LESSON TITLE: Fences for Special Passageways

III. OBJECTIVES: The ability to . . .

A. Determine the passageway needed for machinery.
B. Determine the passageway needed for livestock.
C. Determine the passageway needed for water.
D. Determine the passageway needed for persons.

IV. INTRODUCTION: Many farmers who build good fences do not finish the job with well-built, convenient passageways. This unit deals with passageways for permanent fencing only. Passageways for movable fences are usually very simple.

V. SUBJECT MATTER PRESENTATION:

Questions	Points to Stress
A. What is used for a passageway for machinery and livestock?	1. Farm gates are most used where farm machinery & livestock use the same passageway. 2. Cattle guards can be used where both machinery & livestock use the same passageway. 3. Retainers may be used for hogs & creeps as a barrier for cattle, horses, & mules.
B. What are the com-com types of gates?	1. Types of gates: a. Double braced, all wood gate of 3/4" material. b. Wood gate with steel bracing. c. Heavy duty all wood gate of 1 3/4" material. d. Steel gate with fence filler. e. Aluminum gate.
C. What are the width and height of farm gates?	1. An important consideration as to the width to make your gate is the width of the machinery that will be passing through it. 2. Normally a 10-12 foot gate is wide enough for livestock. 3. 14-16 foot gate is necessary for large farm machines, but in some cases even wider. 4. Most farm gates are 52-54 inches high.
D. How durable are the different gates?	1. Wood-braced and wood-panel gates are estimated to have an average life of 14 years. 2. Wood gates with steel frames have an average life of 14 years. 3. An all steel gate has an average life of 25 years. 4. The life of the wood gates can be greatly increased by treating the wood members with a preservative. 5. Durability of aluminum gates is not as good as for wood & steel gates. The reasons for this are: a. exposed to livestock pressure. b. damage from farm machinery.

Questions	Points to Stress
E. Why use a cattle guard?	1. You can save lots of time by not having to open gates.
F. What are some special features of cattle guards?	1. By making the shields into plank panels they can be let down on the grating so livestock can cross. 2. Can use a temporary guard which could be mounted in the gate opening & towed to another location when desired.
G. What are retainers and creeps?	1. An arrangement that will permit cattle & horses to pass but will retain hogs. Cattle & horses step over the panels & hogs fall between & have no choice but to move to one end or the other. 2. An arrangement that will permit hogs to pass readily underneath but will serve as a barrier for cattle, horses and mules.
H. What are passageways for persons & what types are commonly constructed?	1. An arrangement which provides passageways for people but stop all kinds and sizes of livestock. 2. Stiles are made so that people can walk up over & back down on the other side of the fence. 3. Walk through passageways are limited to turning large animals.
I. What are passageways for water?	1. A structure across a stream, or a draw, that will permit water & debris to pass & still fence livestock. 2. They must have a provision for letting driftwood & rubbish get by or they will clog up and break from upstream water pressure. 3. All wood members must be treated with a preservative to obtain maximum life.

VI. STUDENT ASSIGNMENT:

A. Design and draw a passageway for your particular farmstead.
B. Construct gates for actual farm usage.
C. Construct a concrete cattle guard.

VII. REFERENCES:

A. Planning Farm Fences, AAVIM, Athens, Georgia, 1966, pp. 44-50.

I. UNIT: Fencing

II. LESSON TITLE: The Mathematics of Fencing

III. OBJECTIVES: The ability to . . .

A. Determine how much material is required for a specific fencing problem.
B. Determine the cost of materials required.

IV. INTRODUCTION: Mathematics of fencing is designed to provide the student learner a brief lesson on fencing materials & costs, bearing in mind that prices will change with time & location, but the principles used in calculating should not.

V. SUBJECT MATTER PREPARATION:

A. Problems Information --1. Post costs: a-corners 5" x 8' -- $3.40
b-wood 3 1/2" x 6'6" 1.30
c-steel -- 1.50

2. Wire costs: a-woven 10-47-6-11-20 rds. - $49.00
b-barbed 21 1/2 gage 80 rds. 19.00

B. Problem 1. Given a rectangle 80 rods by 40 rods, what are the answers to the following questions if you put up a 4-wire barbed fence, wooden posts every rod, using 4 corner posts?

a._____ total number of 3 1/2" x 6'6" wooden posts

b._____ total rods of barbed wire needed

c._____ total cost of fence, excluding fasteners & braces.

C. Problem 2. Given a square 20 rod pasture, what are the answers to the following questions, if you put up a woven wire fence with 2 barbs above it. Use 4 corner posts & from the corners begin with 1 wood & 2 sdeel and follow this pattern between corners alternating 1 wood & 2 steel. Posts are spaced 1 rod apart.

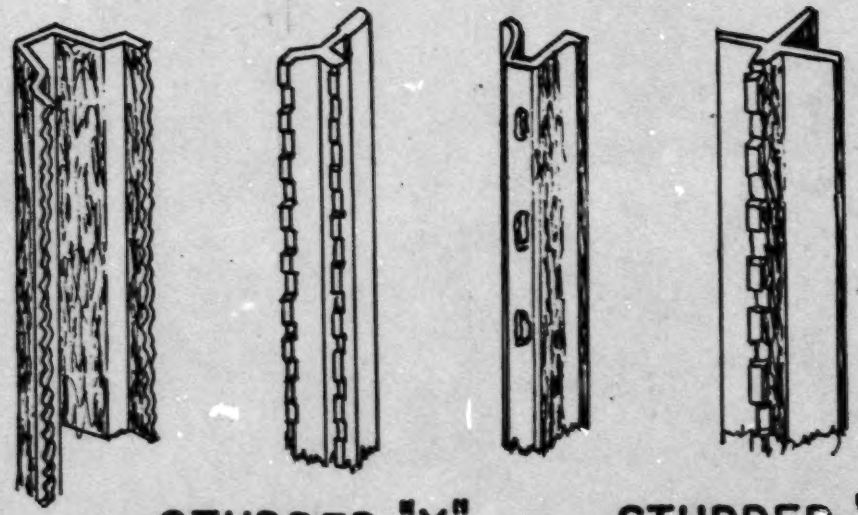
a._____ total number of 3 1/2" x 6'6" wooden posts
b._____ total number of steel posts
c._____ total rods of woven wire needed
d._____ total rods of barbed wire needed
e._____ total cost of the fence, excluding fasteners & braces.

VI. ANSWER SHEET

A. Problem 1 --- a. 236
b. 960
c. $548.40

B. Problem 2 --- a. 28
b. 48
c. 80
d. 160
e. $356.00

STEEL POSTS



"U" BAR

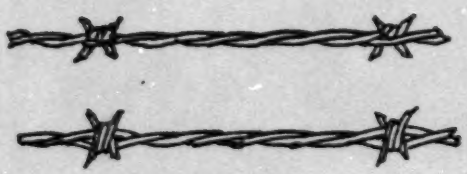
STUDDED "Y"

PUNCHED CHANNEL

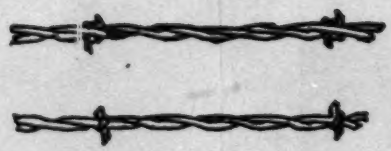
STUDDED "T"

BARBED WIRE

BARB SPACING



4 BARB



2 BARB

12 1/2 GAGE — [4 Barb – 5" spacing
[2 Barb – 4" spacing

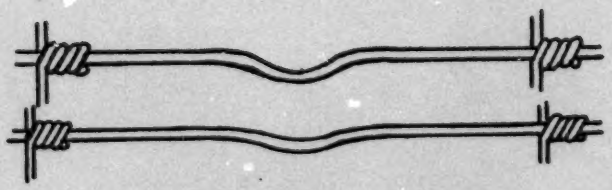
14 GAGE — [2 Barb – 4" spacing

WOVEN WIRE

TYPES OF JOINTS

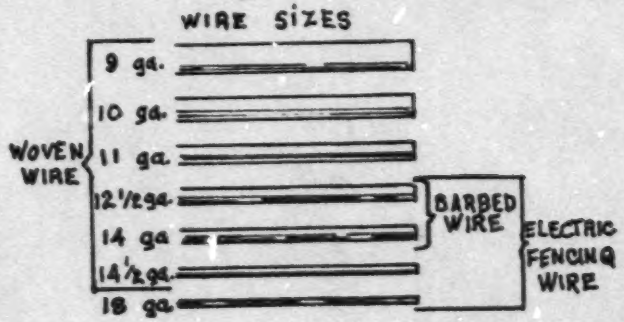
HINGE

STIFF STAY

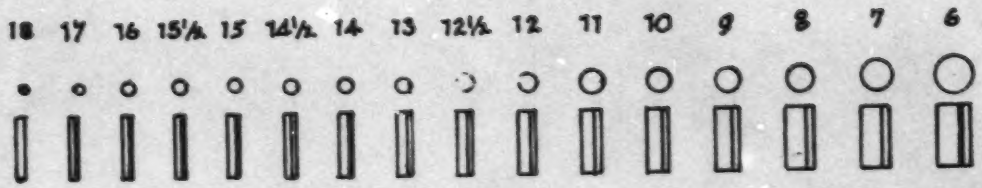


TENSION CURVE

WIRE GAGE
APPLICATIONS & SIZES



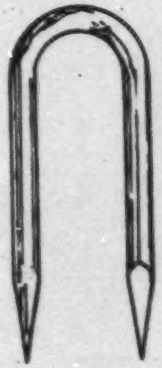
Applications



Sizes

FA

FENCING STAPLES

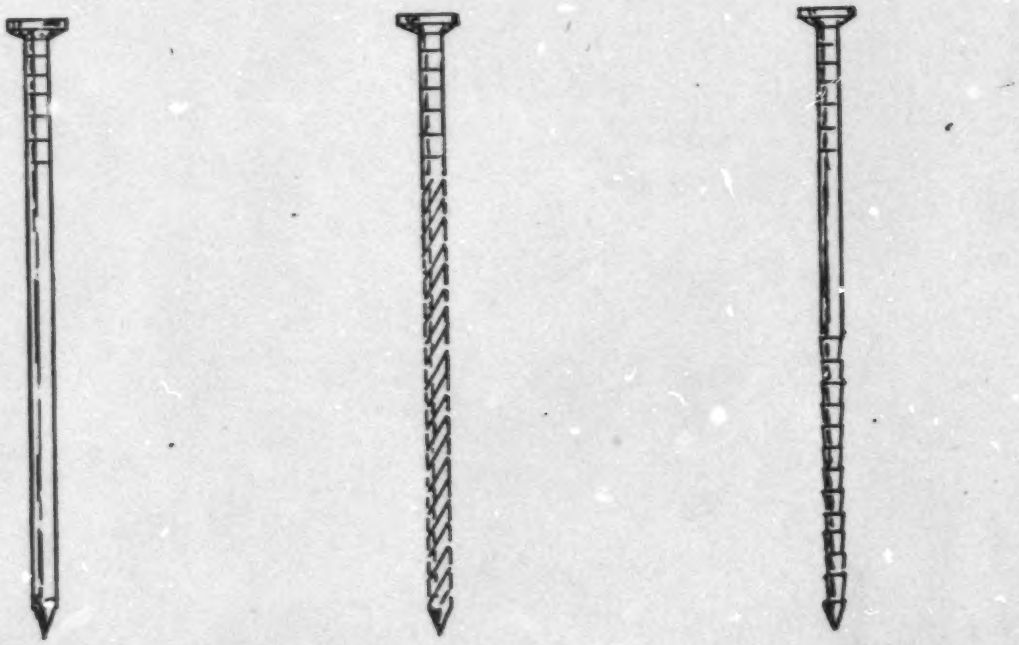


STANDARD "U"

1/4 & 1 1/2"

"L" SHAPED

NAILS FOR BOARD FENCES



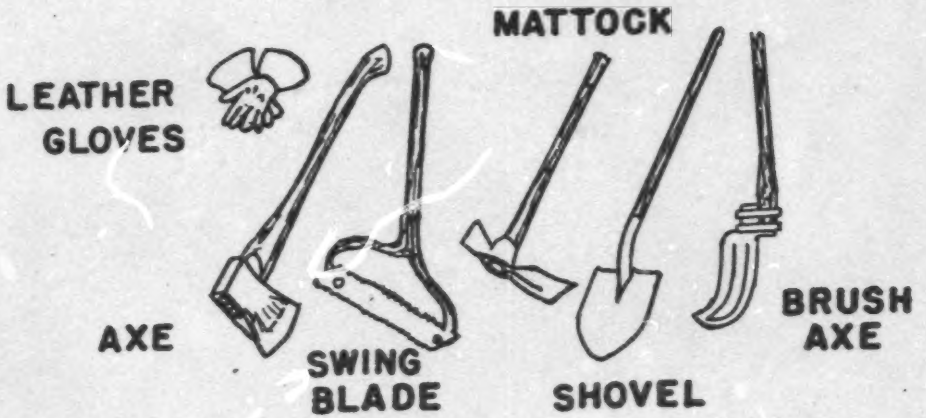
PLAIN SHANK

SCREW SHANK

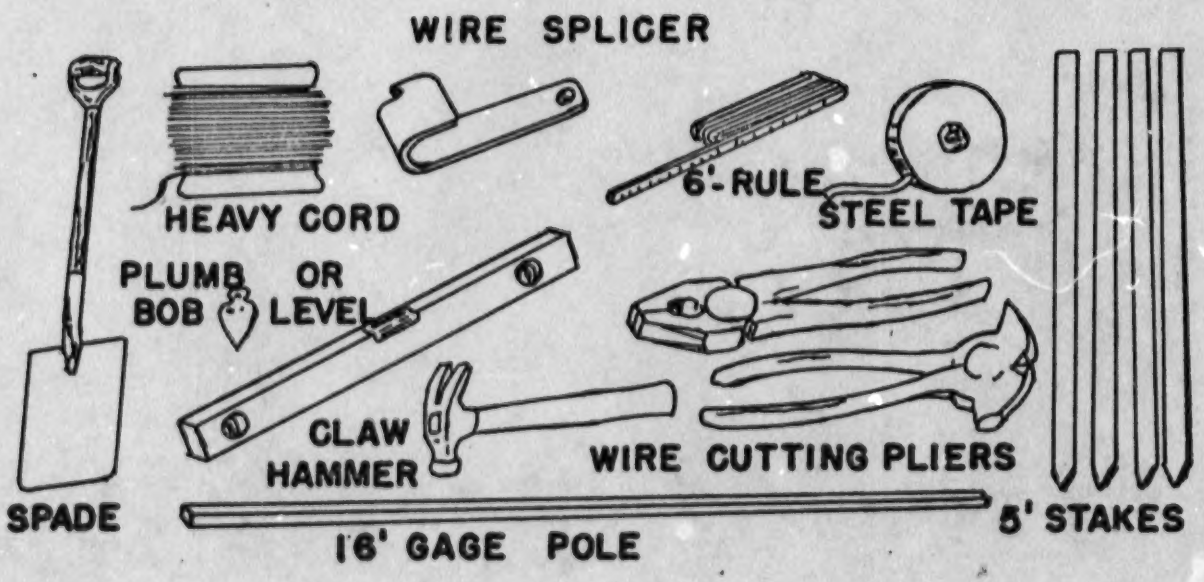
RING SHANK

F6

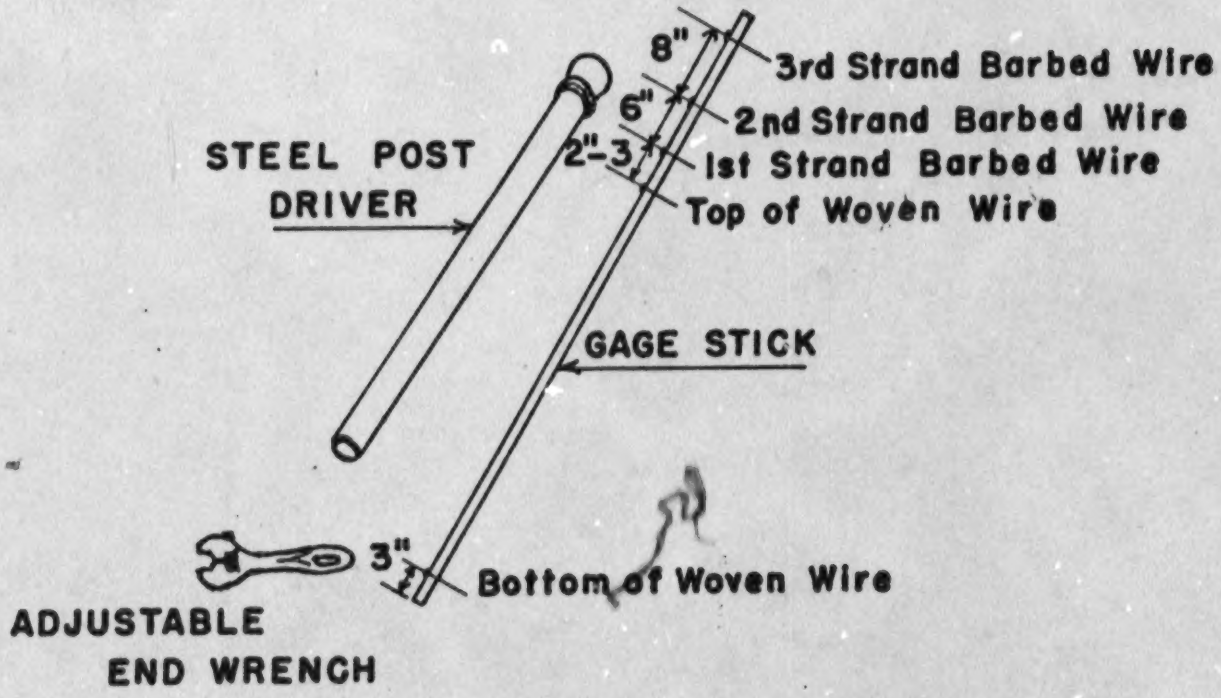
LAND CLEARING TOOLS



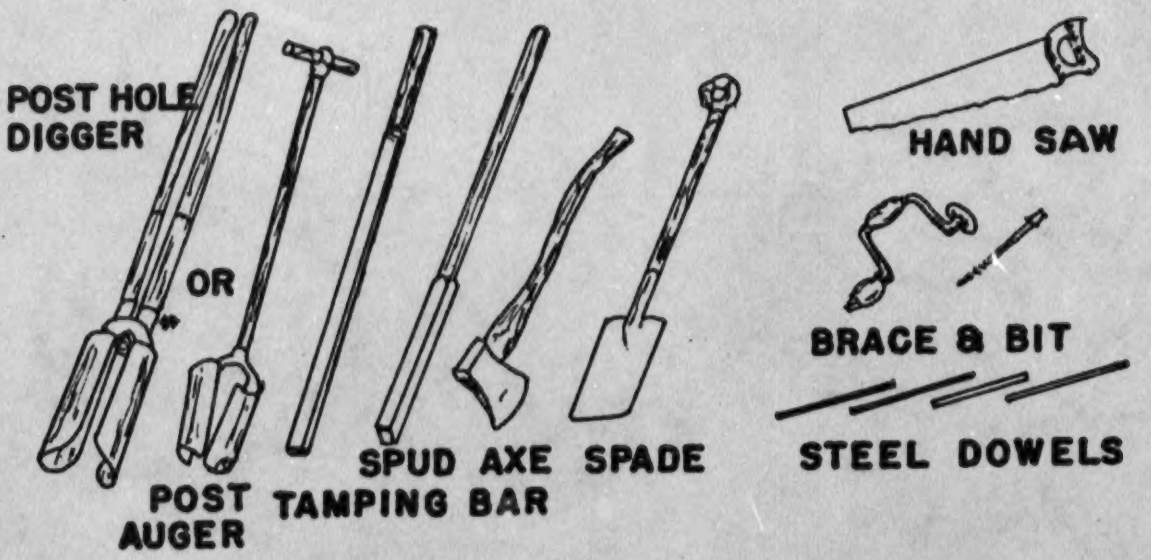
POST ALIGNMENT TOOLS



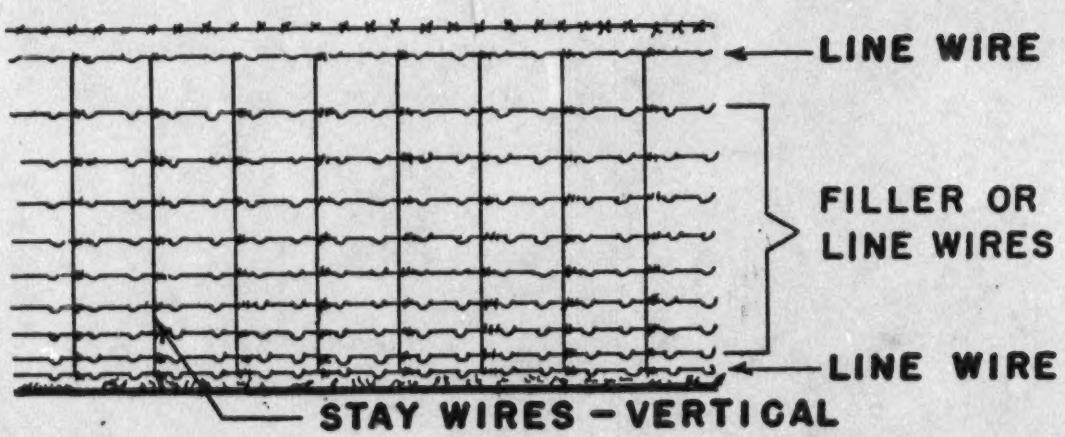
STEEL POST TOOLS



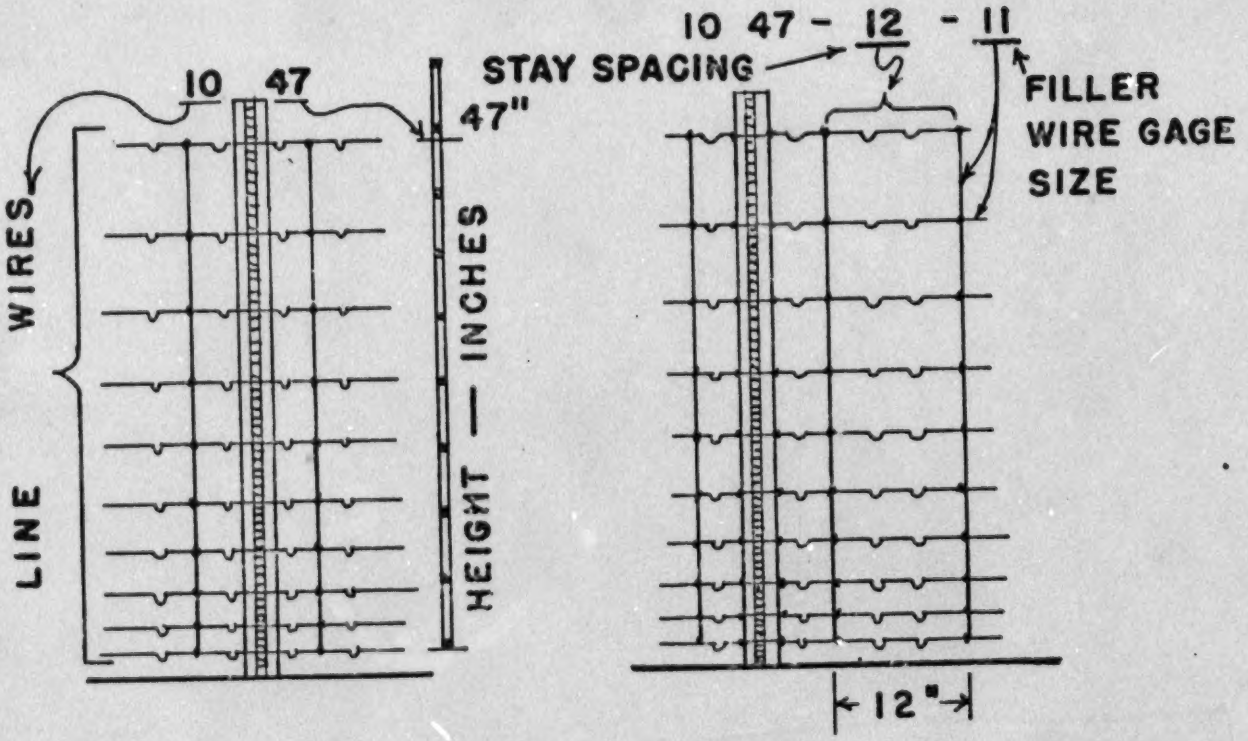
WOOD & CONCRETE POST TOOLS



WOVEN WIRE TERMINOLOGY



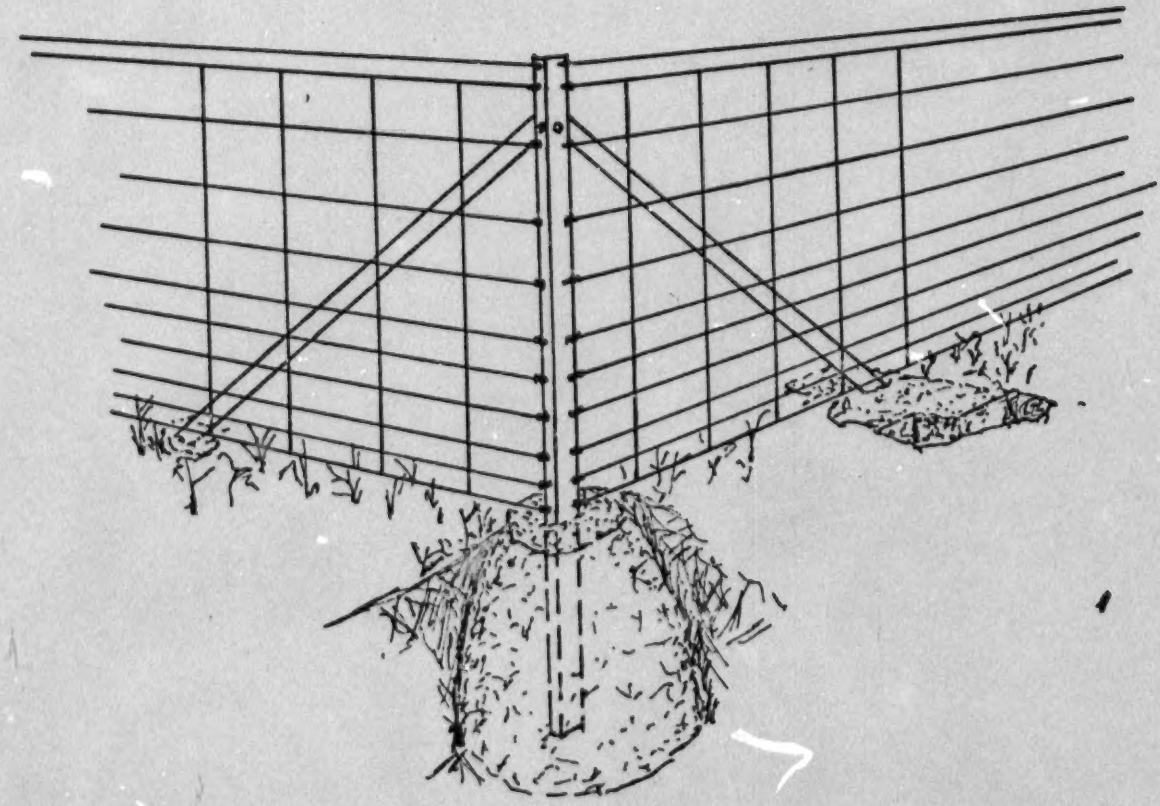
A.. ORDERING WOVEN WIRE BY DESIGN OR STYLE OF FENCE.



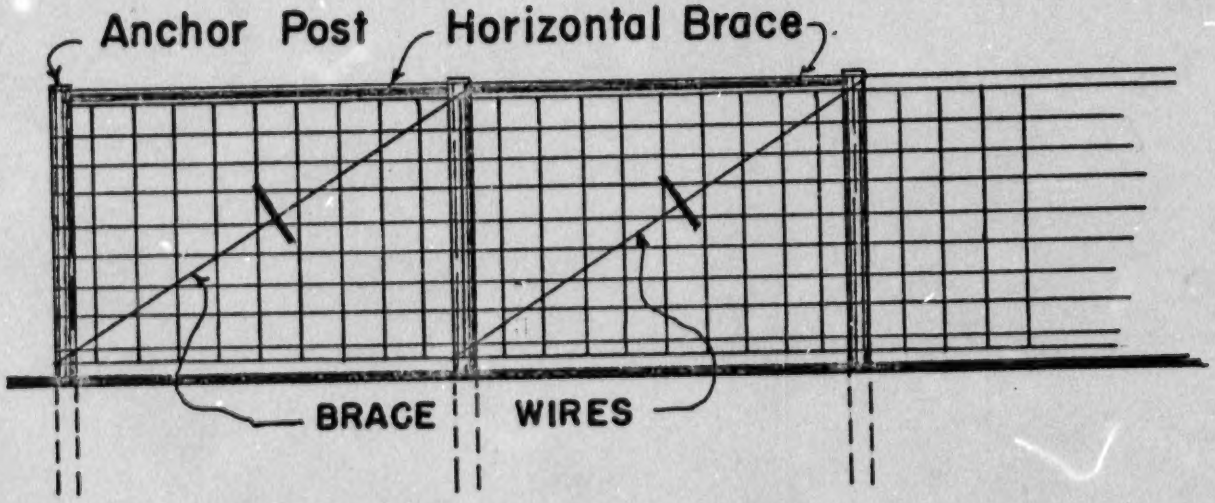
OPTION 1

OPTION 2

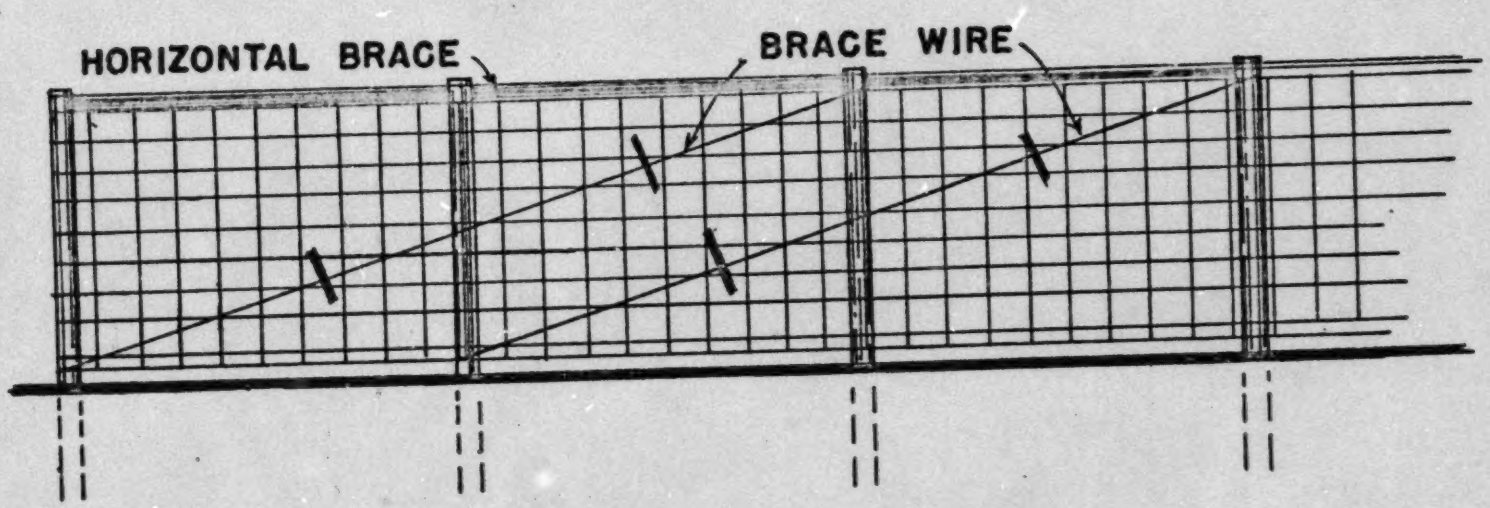
STEEL POST END BRACE



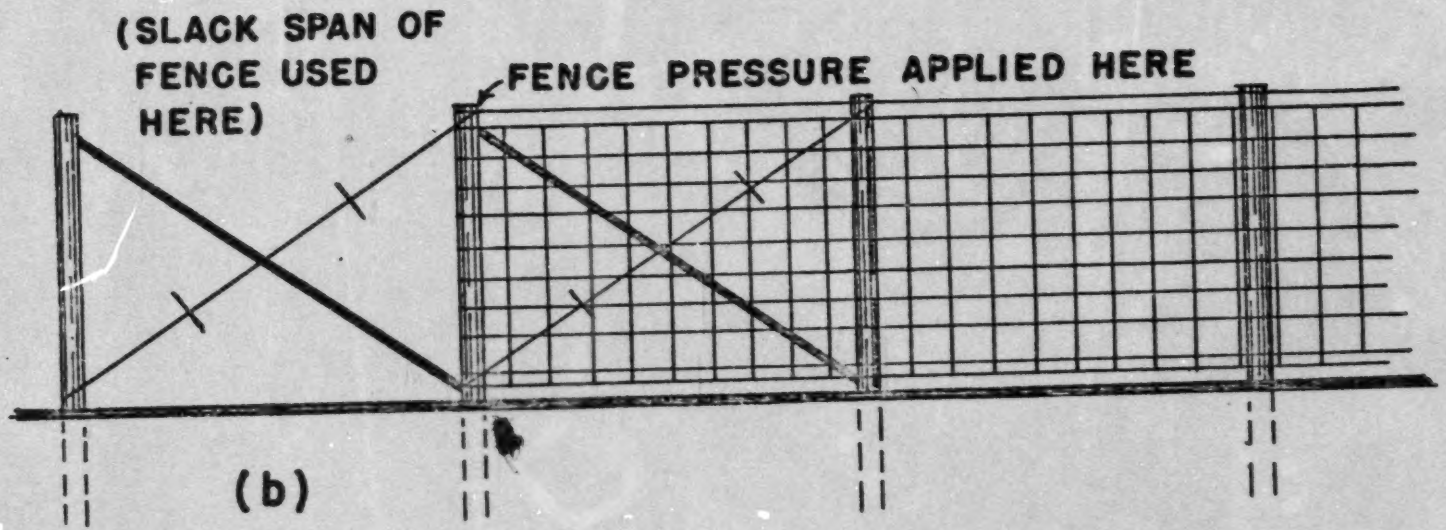
HORIZONTAL END BRACE



ROSEMOUNT DESIGN END BRACE



CROSS-BRACE DOUBLE-SPAN END BRACE



F16